

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1 1. (original) A method of manufacturing a hearing-aid
2 shell, comprising the steps of:
3 nonuniformly thickening a three-dimensional digital model
4 of a shell surface about a directed path thereon to
5 define a thickened model; and
6 generating an undersurface hearing-aid vent in the
7 thickened model of the shell surface, at a location
8 proximate the directed path.

1 2. (original) The method of Claim 1, wherein the digital
2 model of the shell surface is a 2-manifold or 2-manifold with
3 nonzero boundary; and wherein the thickened model of the shell
4 surface is a watertight model that is free of self-
5 intersections.

1 3. (currently amended) The method of Claim 1, further
2 comprising the step of uniformly thickening the digital model
3 of the shell surface relative to the partially offset inner
4 shell surface to determine an entirely offset inner shell
5 surface, and wherein said nonuniformly thickening step
6 comprises the step[[s]] of[:]] nonuniformly thickening the
7 digital model of the shell surface about the directed path to
8 determine a partially offset inner shell surface.[:] and
9 uniformly thickening the digital model of the shell surface
10 relative to the partially offset inner shell surface to
11 determine an entirely offset inner shell surface.

1 4. (original) The method of Claim 1, wherein said
2 nonuniformly thickening step comprises the steps of:

3 nonuniformly thickening the digital model of the shell
4 surface about the directed path to determine a
5 partially offset inner shell surface; and
6 nonuniformly thickening the digital model of the shell
7 surface having the partially offset inner shell
8 surface to determine an entirely offset inner shell
9 surface.

1 5. (original) The method of Claim 3, wherein said
2 nonuniformly thickening step comprises thickening the digital
3 model of the shell surface using a bump function constructed
4 around a kernel defined by the directed path.

1 6. (original) The method of Claim 5, wherein said
2 nonuniformly thickening step comprises the steps of:
3 determining a first offset of the directed path normal to
4 the shell surface; and
5 determining a respective normalized adjusted normal for
6 each of a plurality of vertices on the directed path
7 using parametrizations proportional to a distance
8 between the directed path and the first offset of
9 the directed path.

1 7. (currently amended) The method of Claim 6, wherein
2 said nonuniformly thickening step comprises determining a
3 respective normalized adjusted normal for each of [[a]] the
4 plurality of first vertices on the digital model of the shell
5 surface that are within a support of the bump function, by
6 mixing an estimated normal at the respective first vertex with
7 the normalized adjusted normal at a nearest vertex on the
8 directed path.

1 8. (original) The method of Claim 7, wherein the digital
2 model of the shell surface is a surface triangulation that

3 includes the plurality of first vertices; and wherein the
4 directed path includes at least one vertex that is not a
5 vertex of the surface triangulation.

1 9. (original) The method of Claim 7, wherein said
2 nonuniformly thickening step comprises locally thickening the
3 digital model of the shell surface by moving a first vertex on
4 the digital model of the shell surface along a respective
5 normalized adjusted normal at the first vertex.

1 10. (original) The method of Claim 9, wherein the first
2 vertex is moved a distance defined by the bump function.

1 11. (original) The method of Claim 2, wherein said
2 nonuniformly thickening step comprises the steps of:
3 uniformly thickening the digital model of the shell
4 surface to determine an entirely offset inner shell
5 surface; and then
6 nonuniformly thickening the digital model of the shell
7 surface about the directed path.

1 12. (original) The method of Claim 1, wherein said
2 generating step comprises the steps of:
3 determining an axis of the vent in the thickened model of
4 the shell surface; and
5 determining a surface of the vent about the axis.

1 13. (original) The method of Claim 12, wherein the
2 digital model of the shell surface is a 2-manifold with
3 nonzero boundary; wherein the directed path includes beginning
4 and termination points on the digital model of the shell
5 surface; and wherein the axis of the vent is offset from the
6 directed path adjacent the beginning point and meets the
7 directed path adjacent the termination point.

1 14. (original) The method of Claim 12, wherein the
2 surface of the vent is a triangulation.

1 15. (original) The method of Claim 14, wherein the
2 thickened model of the shell surface has a nonuniformly thick
3 rim; and wherein the surface of the vent intersects the
4 thickened model of the shell surface at a thickest part of the
5 rim.

1 16. (original) The method of Claim 1, wherein said
2 generating step comprises the steps of:
3 determining an axis of the vent in the thickened model of
4 the shell surface;
5 determining for each of a plurality of points on the
6 axis, a respective plane that is normal to the axis
7 and passes through the respective point; and
8 determining for each plane a respective circle having a
9 center on the axis.

1 17. (original) The method of Claim 16, further comprising
2 the steps of:
3 tilting a first plurality of the planes to reduce
4 interferences; and
5 projecting each circle associated with the first
6 plurality of tilted planes as an ellipse on the
7 respective tilted plane.

1 18. (original) The method of Claim 17, further comprising
2 the step of determining a surface of the vent by connecting
3 the ellipses on the first plurality of tilted planes.

1 19. (original) The method of Claim 18, wherein the
2 digital model of the shell surface is a 2-manifold with

3 nonzero boundary; wherein the directed path includes beginning
4 and termination points on the digital model of the shell
5 surface; and wherein the axis of the vent is offset from the
6 directed path adjacent the beginning point and meets the
7 directed path adjacent the termination point.

1 20. (original) The method of Claim 19, wherein the
2 surface of the vent is a triangulation.

1 21. (original) The method of Claim 20, wherein the
2 thickened model of the shell surface has a nonuniformly thick
3 rim; and wherein the surface of the vent intersects the
4 thickened model of the shell surface at a thickest part of the
5 rim.

1 22. (original) A method of manufacturing a hearing-aid
2 shell, comprising the steps of:
3 generating a three-dimensional digital model of a
4 hearing-aid shell surface from point cloud data;
5 automatically nonuniformly thickening the digital model
6 about a directed path that identifies a desired
7 location of an undersurface hearing-aid vent, to
8 determine a thickened model having an entirely
9 offset inner shell surface; and
10 generating the vent in the thickened model, at a location
11 proximate the directed path.

1 23. (original) The method of Claim 22, wherein the
2 thickened model is a watertight model that is free of self-
3 intersections.

1 24. (original) The method of Claim 22, wherein said
2 generating step is preceded by the step of generating point
3 cloud data by scanning an imprint of an ear canal of a user.

1 25. (currently amended) The method of Claim 23, wherein
2 said step of generating [[a]] the vent is followed by the step
3 of printing a hearing-aid shell having a nonuniform thickness
4 and a vent extending therethrough, based on the thickened
5 model.

1 26. (original) A method of manufacturing a hearing-aid
2 shell, comprising the step of: generating a watertight model
3 of a hearing-aid shell by nonuniformly thickening a digital
4 model of a hearing-aid shell surface about a portion of the
5 shell surface that defines a desired location of an
6 undersurface hearing-aid vent.

1 27. (currently amended) The method of Claim 26. wherein
2 said step of generating [[a]] the watertight model comprises
3 nonuniformly thickening the digital model using a bump
4 function constructed around a kernel defined by a set of
5 points on the shell surface.

1 28. (original) The method of Claim 27, wherein the bump
2 function is derived from a Gaussian distribution function or a
3 spline function.

1 29. (original) The method of Claim 26, wherein said step
2 of generating a watertight model is preceded by the steps of:
3 generating a volume triangulation from point cloud data
4 describing a shape of an ear canal of a subject;
5 generating a first surface triangulation that is a 2-
6 manifold from the volume triangulation; and
7 generating a second surface triangulation that is a 2-
8 manifold with nonzero boundary from the first
9 surface triangulation by cutting the first
10 triangulation along a plane.

1 30. (currently amended) The method of Claim 29 further
2 comprising the step of generating [[a]] the hearing-aid vent
3 in the thickened model by:

4 determining an axis of the hearing-aid vent in the
5 thickened model; and

6 determining a surface of the hearing-aid vent about the
7 axis.

1 31. (original) The method of Claim 26, further comprising
2 the step of generating the hearing-aid vent in the thickened
3 model by:

4 determining an axis of the hearing-aid vent in the
5 thickened model; and

6 determining a surface of the hearing-aid vent about the
7 axis.

1 32. (original) A method of manufacturing a hearing-aid
2 shell, comprising the steps of:

3 generating a surface triangulation of the hearing-aid
4 shell from point cloud data describing a shape of at
5 least a portion of an ear canal of a subject;
6 generating a watertight 2-manifold triangulation of the
7 hearing-aid shell from the surface triangulation;
8 generating a 2-manifold with nonzero boundary
9 triangulation of the vent that is compatible with
10 the watertight 2-manifold triangulation of the
11 hearing aid shell; and
12 printing a three-dimensional hearing-aid shell based on
13 the watertight 2-manifold triangulation of the
14 hearing-aid shell and the 2-manifold with nonzero
15 boundary vent triangulation.

1 33. (original) The method of Claim 32, further comprising

2 the steps of: generating a 2-manifold with nonzero boundary
3 triangulation of the hearing-aid shell from the watertight 2-
4 manifold triangulation of the hearing aid shell, by defining
5 vent holes therein; and merging the 2-manifold with nonzero
6 boundary triangulation of the vent and the 2-manifold with
7 nonzero boundary triangulation of the hearing-aid shell to
8 define a watertight 2-manifold triangulation of the hearing-
9 aid shell having a vent therein.

1 34. (original) A method of manufacturing a hearing-aid
2 shell, comprising the step of: thickening a three-dimensional
3 digital model of a hearing-aid shell surface using operations
4 that move each of a plurality of vertices on the shell surface
5 along a respective path that is normal to an inner shell
6 surface.

1 35. (original) The method of Claim 34, wherein the
2 digital model of the hearing-aid shell surface is thickened
3 sufficiently to support formation of a hearing-aid vent in a
4 wall thereof upon printing of the thickened digital model.

1 36. (original) The method of Claim 34, wherein the
2 thickened digital model of the hearing-aid shell is a
3 watertight digital model that is free of self-intersections.

1 37. (original) The method of Claim 34, wherein said
2 thickening step comprises:
3 nonuniformly thickening the three-dimensional digital
4 model of the hearing-aid shell surface about a
5 directed path that identifies a desired location of
6 an undersurface hearing-aid vent, to determine a
7 partially offset inner shell surface; and
8 uniformly thickening the three-dimensional digital model
9 of the hearing-aid shell surface relative to the

10 partially offset inner shell surface to determine an
11 entirely offset inner shell surface.

1 38. (original) The method of Claim 34, wherein said
2 thickening step comprises:

3 nonuniformly thickening the three-dimensional digital
4 model of the hearing-aid shell surface to determine
5 a partially offset inner shell surface; and
6 nonuniformly thickening the three-dimensional digital
7 model of the hearing-aid shell surface having the
8 partially offset inner shell surface to determine an
9 entirely offset inner shell surface.

1 39. (currently amended) The method of Claim 34, wherein
2 the three-dimensional digital model of [[a]] the hearing-aid
3 shell surface is a surface triangulation; and wherein said
4 thickening step is followed by the step of printing the
5 hearing-aid shell based on the thickened digital model.

1 40. (original) An automated hearing-aid shell
2 manufacturing system, comprising:
3 a computer-readable storage medium having computer-
4 readable program code embodied in said medium, said
5 computer-readable program code comprising:
6 computer-readable program code that generates a first
7 digital model of a hearing-aid shell from point
8 cloud data; and computer-readable program code
9 that determines whether first internal hearing-
10 aid components can fit properly within an
11 interior volume of the first digital model of
12 the hearing-aid shell.

1 41. (original) The manufacturing system of Claim 40,
2 wherein said computer-readable program code further comprises:

3 computer-readable program code that generates a second
4 digital model of a hearing-aid shell that is larger
5 than the first digital model, from the point cloud
6 data; and
7 computer-readable program code that determines whether
8 the first internal hearing-aid components can fit
9 properly within an interior volume of the second
10 digital model of the hearing-aid shell.

1 42. (original) The manufacturing system of Claim 41,
2 wherein the first digital model is a completely-in-ear-canal
3 (CIC) digital model and the second digital model is an in-the-
4 ear (ITE) digital model.

1 43. (original) An automated hearing-aid shell
2 manufacturing system, comprising:
3 a scanning tool that generates point cloud data
4 describing a shape of at least a portion of an ear
5 canal of a subject, from the ear canal of the
6 subject or an impression of the ear canal of the
7 subject; and
8 a computer-readable storage medium having computer-
9 readable program code embodied in said medium, said
10 computer-readable program code comprising: computer-
11 readable program code that generates a digital model
12 of a hearing-aid shell from the point cloud data;
13 and
14 computer-readable program code that determines whether
15 size specifications of internal hearing-aid
16 components are compatible with an interior volume of
17 the digital model of the hearing-aid shell.

1 44. (original) The manufacturing system of Claim 43,
2 wherein said computer-readable storage medium comprises

3 computer-readable program code that determines whether size
4 specifications of internal hearing-aid components loaded from
5 an internet site or electronic file are compatible with an
6 interior volume of the digital model of the hearing-aid shell.

1 45. (original) The manufacturing system of Claim 43,
2 wherein said computer-readable storage medium comprises
3 computer-readable program code that generates a digital model
4 of a hearing-aid shell surface as a 2-manifold with nonzero
5 boundary from the point cloud data and nonuniformly thickens
6 the shell surface about a directed path that identifies a
7 desired location of an undersurface hearing-aid vent.

1 46. (original) The manufacturing system of Claim 45,
2 wherein the point cloud data is a 2-manifold triangulation or
3 2-manifold with nonzero boundary triangulation; and wherein
4 said computer-readable storage medium comprises computer-
5 readable program code that generates a digital model of a vent
6 in the nonuniformly thickened shell surface at a location
7 proximate the directed path.

1 47. (original) The manufacturing system of Claim 43.
2 wherein said computer-readable storage medium comprises
3 computer-readable program code that generates a digital model
4 of a hearing-aid shell surface as a 2-manifold with nonzero
5 boundary from the point cloud data and thickens the shell
6 surface using operations that move each of a plurality of
7 vertices on the shell surface along a respective path that is
8 normal to an inner shell surface.

1 48. (original) The manufacturing system of Claim 47,
2 wherein said computer-readable storage medium comprises
3 computer-readable program code that generates a digital model
4 of a vent in the thickened shell surface.

1 49. (original) The manufacturing system of Claim 48,
2 wherein said computer-readable storage medium comprises
3 computer-readable program code that determines whether size
4 specifications of internal hearing-aid components loaded from
5 an internet site or electronic file are compatible with an
6 interior volume of the digital model of the hearing-aid shell.

1 50. (original) A method of generating a digital model of
2 a hearing-aid shell, comprising the step of: generating a
3 three-dimensional model of a hearing-aid shell surface by
4 modifying a shape of a first digital model of a positive or
5 negative representation of at least a portion of an ear canal
6 of a subject to more closely conform to a shape of a digital
7 template of a hearing-aid shell and/or modifying the shape of
8 the digital template to more closely conform to the shape of
9 the first digital model.

1 51. (original) The method of Claim 50, wherein said
2 generating step is preceded by the steps of:
3 generating point cloud data describing a shape of at
4 least a portion of an ear canal of a subject by
5 scanning either the ear canal of the subject or an
6 impression of the ear canal of the subject;
7 generating a volume triangulation from the point cloud
8 data; and
9 generating the first digital model as a surface
10 triangulation that is a 2-manifold or 2-manifold
11 with nonzero boundary.

1 52. (original) The method of Claim 50, further comprising
2 the step of: nonuniformly thickening the three-dimensional
3 model of the hearing-aid shell surface using operations that
4 move each of a plurality of vertices on the shell surface

5 along a respective path that is normal to an inner shell
6 surface.

1 53. (original) A method of manufacturing a hearing-aid
2 shell, comprising the steps of:

3 generating a first digital representation of a positive
4 or negative image of at least a portion of an ear
5 canal of a subject;
6 generating a second digital representation of a hearing-
7 aid shell that has a shape that conforms to the ear
8 canal of the subject; and
9 printing a hearing-aid shell that conforms to the ear
10 canal of the subject, based on the second digital
11 representation.

1 54. (original) The method of Claim 53, wherein the first
2 digital representation is a representation selected from the
3 group consisting of a point cloud representation, a 2-manifold
4 triangulation and a 2-manifold with nonzero boundary
5 triangulation.

1 55. (original) The method of Claim 53, wherein said step
2 of generating a second digital representation comprises the
3 step of modifying a shape of the first digital representation
4 to more closely conform to a shape of a digital template of a
5 hearing-aid shell and/or modifying the shape of the digital
6 template to more closely conform to the shape of the first
7 digital representation.

1 56. (original) The method of Claim 53, wherein said step
2 of generating a second digital representation comprises the
3 steps of: generating a three-dimensional model of a hearing-
4 aid shell surface that is a 2-manifold or 2-manifold with
5 nonzero boundary; and thickening the three-dimensional model

6 of the hearing-aid shell surface using operations that move
7 each of a plurality of vertices on the shell surface along a
8 respective path that is normal to an inner shell surface.

1 57. (original) The method of Claim 53, wherein said step
2 of generating a second digital representation comprises the
3 steps of: generating a three-dimensional model of a hearing-
4 aid shell surface that is a 2-manifold or 2-manifold with
5 nonzero boundary; and nonuniformly thickening the three-
6 dimensional model of the hearing-aid shell surface about a
7 directed path thereon to define a thickened model.

1 58. (original) The method of Claim 57, further comprising
2 the step of generating an undersurface hearing-aid vent in the
3 thickened model of the shell surface, at a location proximate
4 the directed path.

1 59. (currently amended) The method of Claim 58, further
2 comprising the step of uniformly thickening the three-
3 dimensional model of the shell surface relative to the
4 partially offset inner shell surface to determine an entirely
5 offset inner shell surface, and wherein said nonuniformly
6 thickening step comprises the step[[s]] of[:]] nonuniformly
7 thickening the three-dimensional model of the hearing-aid
8 shell surface about the directed path to determine a partially
9 offset inner shell surface., and

10 ~~uniformly thickening the three-dimensional model of the~~
11 ~~shell surface relative to the partially offset inner~~
12 ~~shell surface to determine an entirely offset inner~~
13 ~~shell surface.~~

1 60. (original) An automated hearing-aid shell
2 manufacturing system, comprising:

3 a scanning tool that generates point cloud data
4 describing a shape of at least a portion of an ear
5 canal of a subject, from the ear canal of the
6 subject or an impression of the ear canal of the
7 subject; and
8 a computer-aided design tool that is communicatively
9 coupled to said scanning tool, said computer-aided
10 design tool comprising:
11 a display; and
12 a computer system communicatively coupled to said
13 display, said computer system comprising a
14 processor and a computer program product
15 readable by the processor and tangibly
16 embodimenting a program of instructions executable
17 by the processor to perform the method steps
18 of:
19 generating a first digital model of at least a
20 portion of the ear canal of the subject
21 from the point cloud data;
22 aligning a digital template of a hearing-aid
23 shell with the first digital model; and
24 generating a three-dimensional model of a
25 hearing-aid shell surface by modifying a
26 shape of the digital template to more
27 closely conform to a shape of the first
28 digital model and/or modifying the shape
29 of the first digital model to more closely
30 conform to the shape of the digital
31 template.

1 61. (currently amended) The manufacturing system of Claim
2 60, wherein the three-dimensional model of [[a]] the hearing-
3 aid shell surface is a 2-manifold triangulation or a 2-
4 manifold with nonzero boundary triangulation; and wherein said

5 generating step is followed by the step of thickening the
6 three-dimensional model of a hearing-aid shell surface by
7 moving each of a plurality of vertices on the shell surface
8 along a respective path that is normal to an inner shell
9 surface.

1 62. (currently amended) The manufacturing system of Claim
2 61, wherein said thickening step comprises nonuniformly
3 thickening the three-dimensional model of [[a]] the hearing-
4 aid shell surface about a directed path thereon that
5 identifies a desired location of an undersurface vent.

1 63. (currently amended) The manufacturing system of Claim
2 62, wherein said nonuniformly thickening step comprises
3 nonuniformly thickening the three-dimensional model of [[a]]
4 the hearing-aid shell surface using a bump function
5 constructed around a kernel defined by the directed path.

1 64. (currently amended) The manufacturing system of Claim
2 63, wherein said nonuniformly thickening step is followed by
3 the steps of:

4 aligning a digital model of a frame to the thickened
5 three-dimensional model of [[a]] the hearing-aid
6 shell surface; and
7 modifying a shape of the thickened three-dimensional
8 model of a hearing-aid shell surface to be matingly
9 compatible with the digital model of the frame.

1 65. (currently amended) The manufacturing system of Claim
2 63, wherein said nonuniformly thickening step is followed by
3 the steps of:

4 attaching a digital faceplate model to the thickened
5 three-dimensional model of [[a]] the hearing-aid
6 shell surface; and

7 trimming away portions of the digital faceplate model
8 that are outside an area of intersection between the
9 digital faceplate model and the thickened three-
10 dimensional model of a hearing-aid shell surface.

1 66. (original) The manufacturing system of Claim 65,
2 wherein said trimming step is followed by the step of:
3 digitally smoothing edges of the digital faceplate model.

1 67. (currently amended) The manufacturing system of Claim
2 66, further comprising: a three-dimensional printer that is
3 communicatively coupled to said computer-aided design tool and
4 prints the thickened three-dimensional model of [[a]] the
5 hearing-aid shell surface and digital faceplate model attached
6 thereto, in response to a command from said computer-aided
7 design tool.

1 68. (currently amended) The manufacturing system of Claim
2 64, further comprising: a three-dimensional printer that is
3 communicatively coupled to said computer-aided design tool and
4 prints the modified shape of the thickened three-dimensional
5 model of [[a]] the hearing-aid shell surface in response to a
6 command from said computer-aided design tool.

1 69. (currently amended) The manufacturing system of Claim
2 60, wherein the digital template of [[a]] the hearing-aid
3 shell has an outer surface and an inner surface spaced from
4 the outer surface.

1 70. (currently amended) The manufacturing system of Claim
2 69, wherein the digital template of [[a]] the hearing-aid
3 shell is a watertight model that is free of self-
4 intersections.

1 71. (currently amended) The manufacturing system of Claim
2 70, wherein the digital template of [[a]] the hearing-aid
3 shell is a 2-manifold triangulation having a vent therein.

1 72. (currently amended) A method of generating a digital
2 model of a hearing-aid shell, comprising the step of:
3 generating a first three-dimensional digital model of a
4 hearing-aid shell; printing [[a]] the hearing-aid
5 shell based on the first three-dimensional digital
6 model;
7 generating point cloud data by scanning the printed
8 hearing-aid shell; and
9 generating a second three-dimensional digital model of a
10 hearing-aid shell surface from the point cloud data.

1 73. (currently amended) The method of Claim 72, further
2 comprising the step of: digitally comparing the second three-
3 dimensional digital model of [[a]] the hearing-aid shell
4 surface against at least a portion of a first three-
5 dimensional digital model of a hearing-aid shell to detect
6 differences therebetween.

1 74. (currently amended) The method of Claim 72, wherein
2 said step of generating a first three-dimensional digital
3 model is preceded by the step of generating an initial three-
4 dimensional digital model of [[a]] the hearing-aid shell
5 surface by modifying a shape of a first digital model of a
6 positive or negative representation of at least a portion of
7 an ear canal of a subject to more closely conform to a shape
8 of a digital template of a hearing-aid shell and/or modifying
9 the shape of the digital template to more closely conform to
10 the shape of the first digital model.

1 75. (currently amended) The method of Claim 74, further
2 comprising the step of: digitally comparing the second three-
3 dimensional model of [[a]] the hearing-aid shell surface
4 against the initial three-dimensional model of a hearing-aid
5 shell surface to detect differences therebetween.

1 76. (original) A method of generating a three-dimensional
2 digital model of a hearing-aid shell, comprising the steps of:
3 generating an intermediate model of a hearing-aid shell
4 having a partially offset inner surface by locally
5 thickening a three-dimensional model of a hearing-
6 aid shell surface using operations that move each of
7 a plurality of vertices on the shell surface along a
8 respective path that is defined by a respective
9 normalized adjusted normal to the shell surface; and
10 then
11 globally or locally thickening the intermediate model to
12 define an entirely offset inner surface of a
13 thickened model of the shell surface, using
14 operations that move each of a plurality of vertices
15 on the partially offset inner surface along a
16 respective path that is defined by a respective
17 normalized readjusted normal to the partially offset
18 inner surface.

1 77. (currently amended) The method of Claim 76, wherein
2 said locally thickening step comprises locally thickening a
3 three-dimensional model of [[a]] the hearing-aid shell surface
4 using operations that move each of a plurality of vertices on
5 the shell surface that are within a support of a bump function
6 along a respective path that is defined by a respective
7 normalized adjusted normal.

1 78. (currently amended) The method of Claim 77, wherein
2 said locally thickening step is preceded by the step of
3 designating a location of an undersurface hearing-aid vent on
4 the shell surface; and wherein said locally thickening step
5 comprises locally thickening a three-dimensional model of
6 [[a]] the hearing-aid shell surface using operations that move
7 each of a plurality of vertices on the shell surface a
8 distance no less than about $2r+2w-s$, where r designates a
9 radius of the vent, w designates a wall thickness and s
10 designates a shell thickness.

1 79. (original) The method of Claim 78, wherein said step
2 of globally or locally thickening the intermediate model is
3 followed by the step of repairing self-intersections on the
4 entirely offset inner surface.

1 80. (original) The method of Claim 79, further comprising
2 the step of generating an undersurface hearing-aid vent in the
3 thickened model of the shell surface.